RICHMOND'S WATER POWER

The Water Power of the James River

UTILIZED BY THE

VIRGINIA ELECTRICAL RAILWAY AND DEVELOPMENT COMPANY

AT

RICHMOND, VIRGINIA.

Virginia Electrical Railway and Development Company.

INCORPORATED, 1898. *FRANCHISE GRANTED 1898.*

WORK COMMENCED JUNE, 1899. *MACHINERY STARTED FEBRUARY, 1901.*

E. L. BEMISS, . . PRESIDENT.

W. M. HABLISTON, . . VICE-PRESIDENT.

EVERETT WADDEY, . SECRETARY AND TREASURER.

REUBEN SHIRREFFS, . . CHIEF ENGINEER.

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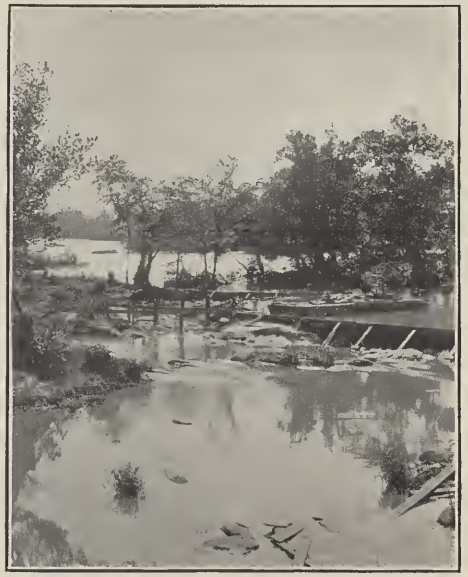
SKETCH OF RICHMOND.

THE locality now occupied by the City of Richmond was first seen by white men on May 21, 1607, when an exploring party under Newport and John Smith landed at the foot of the rapids. An attempted settlement two years later failed to be permanent; a series of disasters followed, culminating in 1622 in a great massacre of the settlers by the Indians. In 1645 Fort Charles was built on the hills on the south side of James river, within the present limits of the City of Manchester, as an outpost of the colonists on the river below. Later Col. William Byrd, the first of the name, obtained from the crown a grant of a considerable territory, and established a trading post and his residence near the present site of the State Penitentiary. His son of the same name laid out the town in 1737 and called it Richmond.



OLD HAXALL DAM.

The growth at first was slow. It was in those days the "far west," and the troublous times of the Revolution were not favorable to expansion. In 1779 it was made the seat of government of the State, at which time the inhabitants numbered only 700. In 1781 it was occupied by British troops, under Benedict Arnold, and many public and private buildings were burned. Four years later the Capitol building was begun, and it stands to-day, not very much changed, recalling the memories of the great Jefferson, its designer and the founder of the University of Virginia, the alma mater of many of Richmond's leading sons.

Soon after the war of 1812, during which the city was fortified, Richmond assumed a leading position among southern cities (excluding, of course, New Orleans) in wealth, commerce, literature and social life, which has never since been wrested from her. During the terrible days following 1861 Richmond, as the Capital of the Confederacy, was the very vortex of the strife, and she only emerged therefrom sadly crippled and battle scarred. With spirit undaunted, however, her people set about repairing the havoc wrought, with how much success her fine public edifices, her busy marts of trade, her numerous and important manufactures will best testify. Left at the close of the war with an impoverished population of not over 40,000, and with the greater part of her business territory in ashes, she is to-day, although

Atlanta has a slightly larger population, second only to New Orleans among all her southern sisters in wealth, in commerce and in manufacturing.

The following table gives the census of the city for the past forty years:

1860, - - - - - - -	37,910
1870, - - - - - - -	51,000
1880, - - - - - - -	62,882
1890, - - - - - - -	81,298
1900, - - - - - - -	85,050

The small increase in the last decade has been due to the large growth at her expense of her contiguous suburbs. The urban and contiguous suburban population served by the Post-offices of Richmond and Manchester is estimated at 125,000 people, and these form practicallv one community for all purposes except the levying and expending of municipal taxes.

Description.

Richmond is charmingly situated at the head of tide-water, on the James river, about 100 miles from its mouth and at the foot of the last grand leap over the rocks made by the waters of this often turbulent, sometimes grand and picturesque, but always beautiful stream in their journey from the mountains to the sea. The residence sections occupy two high hills, while the valley between and the river bank is given over to the purposes of trade and manufacturing. Directly opposite to Richmond, on the south side of the river, and connected with it by numerous bridges, is the thriving City of Manchester.

Among the notable public buildings in the city may be mentioned the State Capitol (1785), with its wealth of historic associations ; the State Library (Executive) building (1894); the City Hall (1893), a fine structure costing $1,400,000 ; the splendid Jefferson Hotel (1894), erected through the public-spirited liberality of the late Maj. Lewis Ginter ; the Masonic Temple (1890); Richmond College, and last, but not the least interesting, old St. John's Church, which still stands substantially as it was when Patrick Henry, on the 23d of March, 1775, addressing the second Revolutionary Convention, gave utterance to the patriotic aspiration by which he is best remembered and his memory most revered.

Richmond boasts an unusual number of monuments and statues for a city of its size. Pre-eminent among them is undoubtedly the Washington Monument, surmounted by a large equestrian figure of the Father of his Country, while grouped around the base are smaller figures of those famous Virginians, Nelson, Marshall, Henry, Jefferson, Lewis and Mason. This work of art, begun by the sculptor Crawford, and finished after his death by Randolph Rogers, has been pronounced by competent judges as fine as anything of its sort in the world.

The educational facilities of Richmond are excellent ; her public schools are numerous and well maintained, while in addition to Richmond College and the Woman's College, within the corporation, there are within the State the Union Theological Seminary (Presbyterian), about a half mile away; Randolph-Macon College (Methodist) at Ashland (18 miles); William and Mary College, of pre-revolutionary fame, at Williamsburg ; the University of Virginia at Charlottesville ; the Washington and Lee

THE WILLIAM R. TRIGG COMPANY. SHIPBUILDING PLANT.

University, and the Virginia Military Institute at Lexington, and at Blacksburg the Virginia Polytechnic Institute. Richmond is essentially a church-going community. The number of her churches is unusually large, and some of her pastors have achieved a more than national reputation.

PORTION OF DAM SHOWING DROPPING CREST.

The City owns its own water-works plant, which is operated by water power, and furnishes an abundant supply at a cost as low as in any, and lower than in most of the cities of this country. It also owns and operates its own gas works. The value of these plants and other municipal property is estimated to exceed by more than half a million dollars the debt of the city.

Transportation Facilities.

The James river, navigable to Richmond with nineteen feet of water, permits direct communication with all parts of the world, and two lines of steamers, the Old Dominion and the Clyde Line, make regular trips to New York and Philadelphia, while a third line plies regularly between Richmond and Norfolk.

Washington, Baltimore and New York are readily reached over the Richmond, Fredericksburg and Potomac, the Seaboard Air Line and the Chesapeake and Ohio railroads, while the latter superb system, by its main line and by its James River Division (formerly the Richmond and Alleghany Railroad), with its extremely favorable grades, brings the great West actually very much nearer to Richmond and the Virginia seaboard than it is to the large exporting cities of the North. The Norfolk and Western Railroad also, having access to the city over a connecting line, is a strong competitor for western and southwestern business. South and southwest Richmond railway connections are now almost perfect. Three great systems, the Atlantic Coast Line, the Southern Railway and the Seaboard Air Line give quick and direct access and competitive service to all parts. The latter trunk line, which

Headgates Opening Into Canal.

only became an assured fact during the past year by the consolidation of several minor lines and the construction of several missing links, including a new line from

chiefly due to the energy and business sagacity of one of her citizens.

The Atlantic Coast Line roads have for some years had

NORTHERN PORTION OF NEW DAM, SHOWING ALSO NEW VIADUCT OF CHEAPEAKE AND OHIO RAILWAY.

North Carolina to Richmond, may be pointed to with pride as a forceful illustration of Richmond push and enterprise, the successful issue of the consolidation being

adequate depot facilities, and the Southern Railway completed last year a handsome and commodious station. With the completion of the new Union depot now under

construction on Main street for the joint use of the Chesapeake and Ohio and the Seaboard Air Line railways Richmond will be abreast of any city of her size in this particular. In passing, attention should be called to the magnificent double-track iron viaduct which the Chesapeake and Ohio Railway has been constructing during the past two years and which is now nearing completion. This structure, intended to afford an improved connection between the James river and the Peninsular divisions of the road, will be about three miles long and will cost in the neighborhood of $2,000,000.

Richmond is well provided with street railway facilities. There are two systems, affording by their numerous lines quick access between all parts of the city and to its suburbs. These lines are all electrically equipped, and one of them is extremely interesting in street railway history as the scene of the first real success of electric traction. This line was opened to travel in 1889.

Commercial and Manufacturing Interests.

Richmond has five National and four State banks, four trust companies and a number of reliable private banking houses. The following comparative statement of the condition of the National, State and savings banks of the city illustrates well the financial strength of Richmond and the volume and growth of its general business transactions:

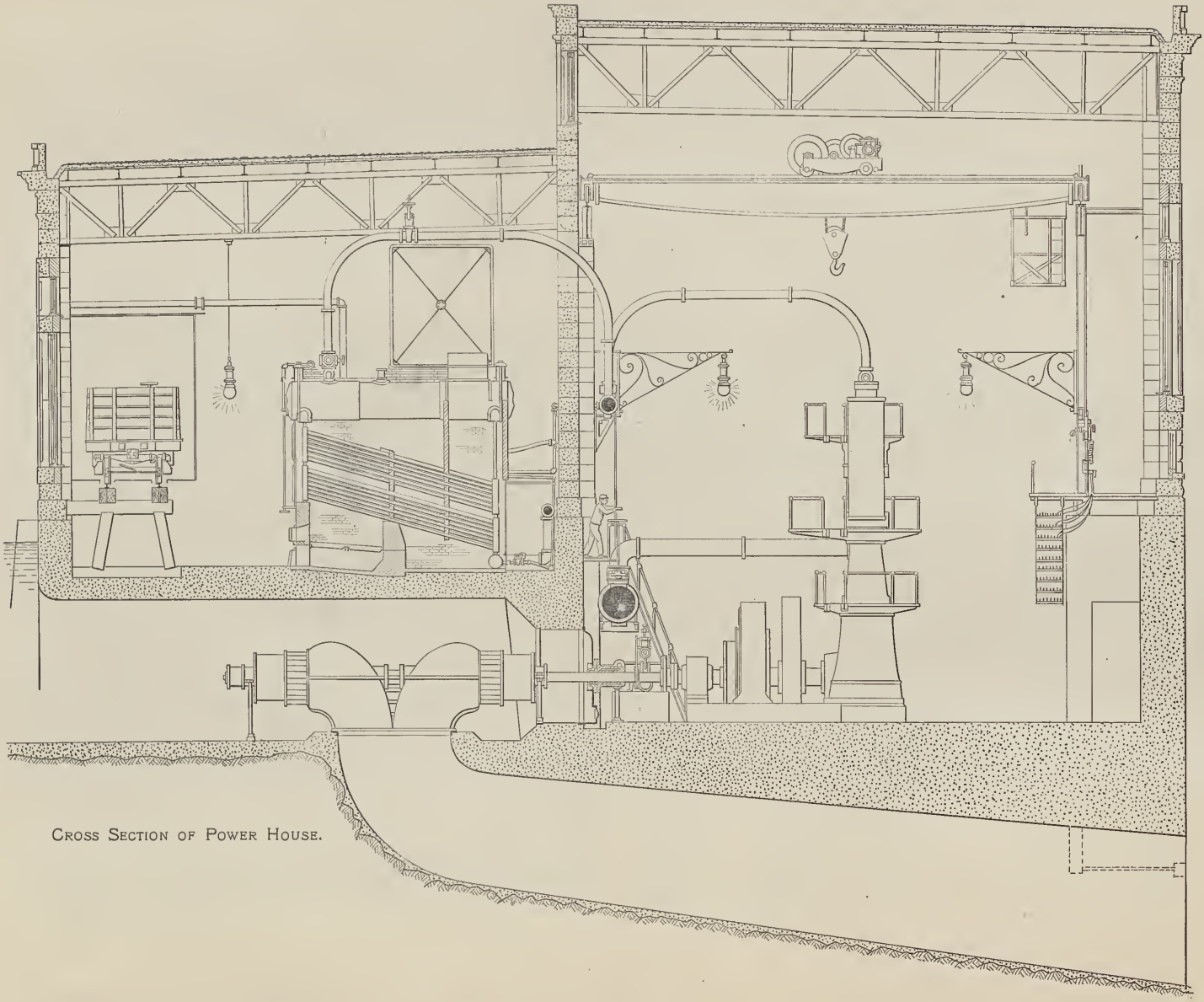
	1890	1898.	1900.
Resources	$13,597,170	$19,007,987	$24,117,696
Liabilities, other than	9,267,087	13,368,047	18,046,273
Capital stock and undivided surplus	4,330,083	5,639,940	6,071,423
Increase in capital		1,309,857	431,483

	1890.	1898.	1899.	1900.
Bank Clearances	$111,207,944	$133,618,376	$165,901,087	$175,653,845
Increase		21,410,432	32,282,711	9,752,758

Richmond has long been known as the largest shoe buyer of all the southern cities, but that she has a very large jobbing trade in all lines the following figures will prove:

	1899.	1900.	Increase.
Capital invested in jobbing houses	$ 8,176,500	$10,072,000	$1,902,500
Sales for the year	35,777,295	38,634,700	2,857,405

All the world is familiar with Richmond's pre-eminence in the handling, manufacturing and exporting of tobacco. Here are located some of the largest factories operated by the American and the Continental Tobacco Companies and the factories of the T. C. Williams Co., and a host of others large and small, and hither come the representatives of European governments to purchase supplies of the fragrant weed. All the world, however, is not so familiar with the magnitude of the iron and steel industries of the city. Some of the concerns in this line are long established, as the Tredegar Company, with its twenty-three acres and nearly 1,000 employes, and the Old Dominion Iron and Nail Works Company, with its fifty acres, its plate mill, bar mill, nail department, roofing-plate department, &c. Others, while established for several years, have recently been so remodelled or extended as to be scarcely recognized as the same plants. To this class belong the Cardwell Machine Company, and most notably the Richmond Locomotive Works, whose products are



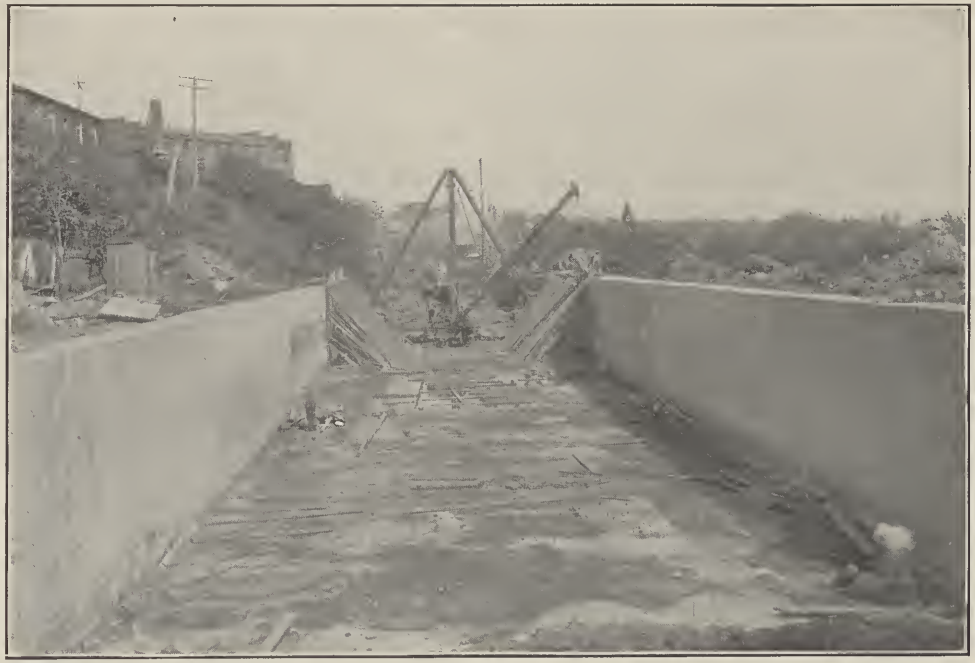
Cross Section of Power House.

now known, and their reputation established, in all civilized countries. The most recent additions to this plant are not yet completed, but when they are the works will have a capacity of 250 locomotives per year and will employ about 2,000 men.

Finally, there are the recently-established plants like the ship-building plant of the W. R. Trigg Company, which, although only begun to be built twenty-eight months ago, and with very considerable extensions still under construction, has finished one torpedo-boat, has nearly finished two others and two torpedo-boat destroyers, and has under construction an armored cruiser for the government, besides a large amount of work for private parties.

Besides the above, to show the diversity of the manufacturing interests, mention may be made of the Virginia-Carolina Chemical Company, whose headquarters and one of its largest fertilizer factories, are in this city; of the Southern Manufacturing Company, the largest manufacturer of baking powder in the country, and of the Richmond Cedar Works, with its large output of wooden wares.

The following summary will show the importance of the manufacturing interests to the city :

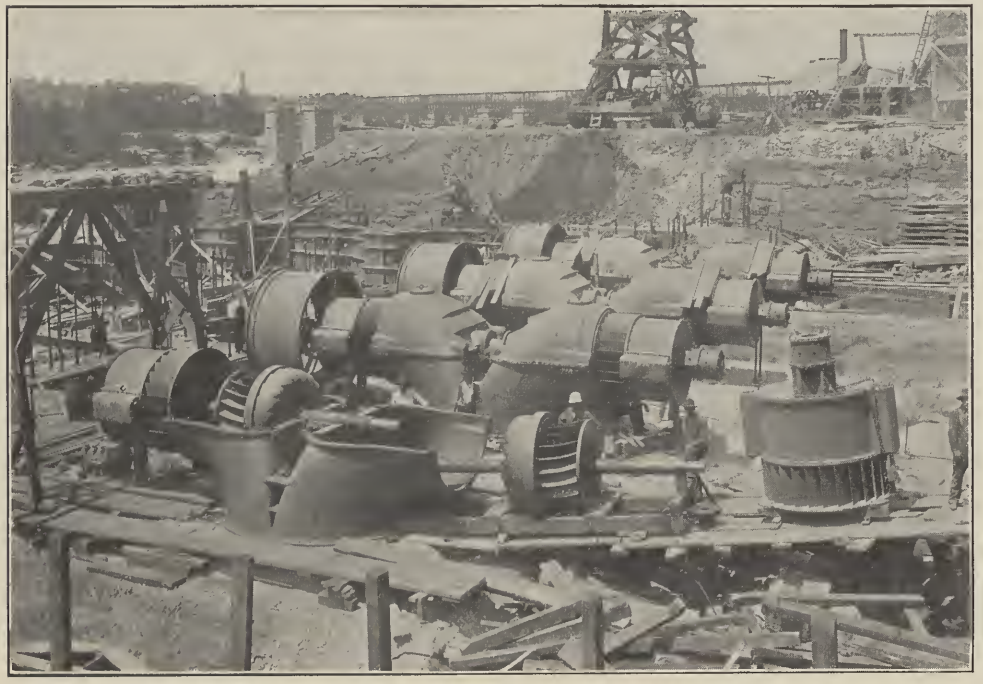


PORTION OF FINISHED CONCRETE WALLS OF CANAL.

	No. of Plants.	No. of Hands.	Capital in Business.	Sales of the Year.
1900	1,318	25,563	19,125,980	48,861,864
Increase over 1899	73	4,340	1,793,640	7,494,941

WATER POWER DEVELOPMENT.

Within the three miles just above the limit of the tidal ebb and flow the fall of the James river is 84 feet and within nine miles the fall is 112 feet. Above this point the watershed of the river is 6,900 square miles and its low summer flow seldom falls below 1,500 cubic feet per second. With the larger fall this amount of water is capable of producing 15,000 horse power, and for a large part of the year a much greater quantity might be obtained.



GROUP OF TURBINES IN POSITION BEFORE ERECTION OF POWER HOUSE.

Unfortunately for the best development of this power, it has in the course of time been divided among a number of independent and sometimes opposing interests, none of which obtain from the portion used the best results. This was the natural outcome of the lack of means for distributing to many users the power developed at one large plant, such as is now afforded by the agency of electricity. Among these various owners of water power were the once famous Haxall-Crenshaw flouring mills, situated on the north bank of the river, just at the head of tide water. These mills, together with the adjacent Gallego mills, were at one time the pride of Richmond, and were very successful. But with changed

MAP OF RICHMOND

Scale

0 1000 2000 3000 4000

Richmond Locomotive & Machine Works

Air Line

Seaboard

Richmond, Fredericksburg & Potomac

Rosencock Brewing Co.

Union Stock Yards

R.F.&P. Shops

Fair Grounds

Baseball Park

Richmond College

Monroe Park

Park Ave.

Beach St.

Soldiers Home

Boulevard 2½ miles

Main St.

2 miles

Mulberry St.

Robinson St.

Strawberry St.

Beverly St.

½ mile

Reservoir

Lake

Reservoir Park

New Reservoir

Ashland

Hollywood Cemetery

Chesapeake & Ohio

Ohio

Tredegar

Albemarle Paper Mills

City Water Works

JAMES

BELLE ISLE

Old Dominion Iron & Nail Wks.

Canal

Richmond and Petersburg

Va. Electric Power Co. Dam

Free Bridge

Manchester

S.A.L. Ry.

H.O. Shops

Va. Electric Co.

Shepherd Pulley Shop Works

Main St.

Cary St.

Broad St.

Marshall St.

Grace St.

Franklin St.

Capitol

State Capitol Square

Union Sta.

Richmond Locomotive Works

Richmond Tractions Ry.

Richmond Cedar Works

Richmond Stove Works

Gas Works

Rockets

Nicholson St.

Williamsburg

Orleans St.

Chimborazo Park

Rich. York River & Ches.

W. H. Trog Co. Shipbuilding Yards

P.O. HOUSE

VA. ELECTRICAL RWY. & DEV. CO.

Mayo Is.

Brown's Is.

Canal

R

I V E R

½ mile

1 mile

1½ miles

2 miles

Cedar Works

Virginia Carolina Chemical Co.

Richmond & Petersburg

Carolina

Street car lines shown thus

Steam roads " "

Conduits " "

Edison tubes " "

CHRISTOPHER ENG. CO. RICH'D

MAP OF
RICHMOND

MAKING THE FOUNDATIONS OF THE POWER HOUSE—SHOWING TRANSPORTER DELIVERING LOAD OF CONCRETE.

conditions of transportation their prosperity gradually declined, and several years ago they were obliged to suspend operation, and the property came upon the market. It was bought by the Virginia Electrical Railway and Development Company in the fall of 1898, and the work of constructing the power plant thereon, now nearing completion, was begun early in 1899.

While he was not the first to call attention to the capability of the water power at Richmond for better development, to Mr. F. C. Todd, of Baltimore, great credit is due for having taken up the matter in an earnest and practical way, and for having, by long perseverance, in the face of great discouragements, ensured the accomplishment of the work in hand. The necessary financial aid was provided under the leadership of Messrs. John L. Williams & Sons, of Richmond, to whom the city is largely indebted for much of its recent progress, and of Messrs. Middendorf, Oliver & Co., of Baltimore. A very considerable portion of the investments are held by citizens of Richmond.

Works of the Virginia Electrical Railway and Development Company.

The plant of this company, which will supply electrical energy for any purpose for which it may be desired and within any feasible distance, comprises at present:

A dam across James river, controlling the entire flow.

A canal leading from the north end of this dam to the power house, a distance of 2,200 feet.

The station, or power house, with its machinery, having a total present installation of 5,600 horse power, and

The distributing system, consisting of a large installation of underground conduits and Edison tubes and several pole line routes with overhead feeders.

Dam.—The dam is a concrete masonry structure, about 1,700 feet long, exclusive of the guard wall at the upper end of the canal. The average height of the crest is only about five feet above the solid granite bed of the river, the maximum height being about eight feet. It was desired to carry in the canal a greater head of water than would have been afforded with the increased quantity by a dam at the same height as the old Haxall dam, yet a higher dam than this would have, perhaps, created serious damage in extreme freshets to property above the dam. The somewhat novel plan was, therefore, adopted, which is well illustrated on page 6. Piers were built at intervals of forty feet along the top of the dam. These piers are built to a height which will be above the highest freshets, and to them are hinged timber gates, which are capable of being lifted above the freshet levels in floods, but which, when resting on the masonry dam, will maintain the surface of the water four feet above the masonry crest. These gates are manipulated by mechanism on a car, which is moved from gate to gate on a bridge supported by the piers of the dam. Although the height of the dam, even with the addition of the movable gates, is so small, the fall of the river bed is so rapid that at the power house, only 2,200 feet below, the maximum head and fall will be twenty-seven feet.

Canal.—The upper nine hundred feet of the canal is a natural channel, enlarged by excavation of earth and rock to an average area of waterway of 1,200 square feet. The remaining 1,300 feet, however, consists of a canal with concrete masonry side walls and a smooth lining of concrete

Views of the Power House in Various Stages of Construction.

masonry on the bottom. The masonry walls were necessary to hold the banks, since for the greater part of the distance the width available for the canal was limited. The lining of the bottom was put in, however, solely to increase the capacity to carry water, the lower part of the excavation being in solid rock for the entire length of the canal. The dimensions of the canal are fifty feet width by thirteen feet depth of water. It is expected that 5,500 to 6,000 cubic feet of water per second can be drawn through it without a loss of more than twelve to fifteen inches in the whole length. The velocity of the current will then be about nine feet per second or over six miles per hour.

An unusually large amount of gateage has been provided at the upper end to diminish the loss of head at this point. There are ten openings each twelve feet wide by eight feet high. These openings are provided with heavy timber frames, each of which supports five small gates. These small gates will be used to regulate the supply of water when the river is high, but when the river is low, the frames and gates can be raised entirely out of water, leaving the large openings unobstructed.

Power House.—Like the canal excavation the excavation for the power house foundations was very largely in the solid rock, the quantity of rock excavation done within the lines of the power house and in the tail race, to allow a free discharge of the water, amounting to some 19,000 cubic yards. On account of the very great machinery weights and strains on the one hand and the very great upward pressure of the water in extreme freshets (which reach a level some twenty feet above the machine room floor) on the other, the foundations of the power house have been made unusually massive. Under the machine room the entire space to the excavated rock is solidly filled with concrete masonry, except for the tunnels (draft tubes) which lead off the discharge of the turbines. These draft tubes are circular in section, ten and a half feet in diameter at the outlet of the wheels, enlarging to fourteen feet at the river end. The wheel chambers are arched over the top and these arches utilized to support the steam boilers.

The extensive use of concrete masonry is a notable feature of this work, not only the dam, canal masonry and power-house foundations being constructed therewith, but also the walls and roof of the power-house, the switchboard gallery floor and even the outer shell of the chimney. For the most part Portland cement has been used in the fabrication of the concrete, but in some places, where only mass or weight was required, natural cement was used. The stone from the various excavations furnished excellent material for the concrete, although, for the greater part, it would not have been suitable for stone masonry. The use of concrete, therefore, resulted in very considerable economy in the foundation work, and in the construction of the house and chimney it enabled architectural effects to be obtained, which would have been too costly in stone, at a cost not very much more than that of good brick masonry.

The foundation concrete was made as a monolith, in forms built up for the purpose, and the shaft of the chimney was constructed in the same way. The walls of the superstructure, however, were built of blocks of concrete previously moulded in boxes, and laid up in the walls precisely as stone ashlar would be laid. All the concrete

View of Completed Portion of Power House from the Southeast.

blocks were prepared, each for its place, before the erection of the superstructure was begun.

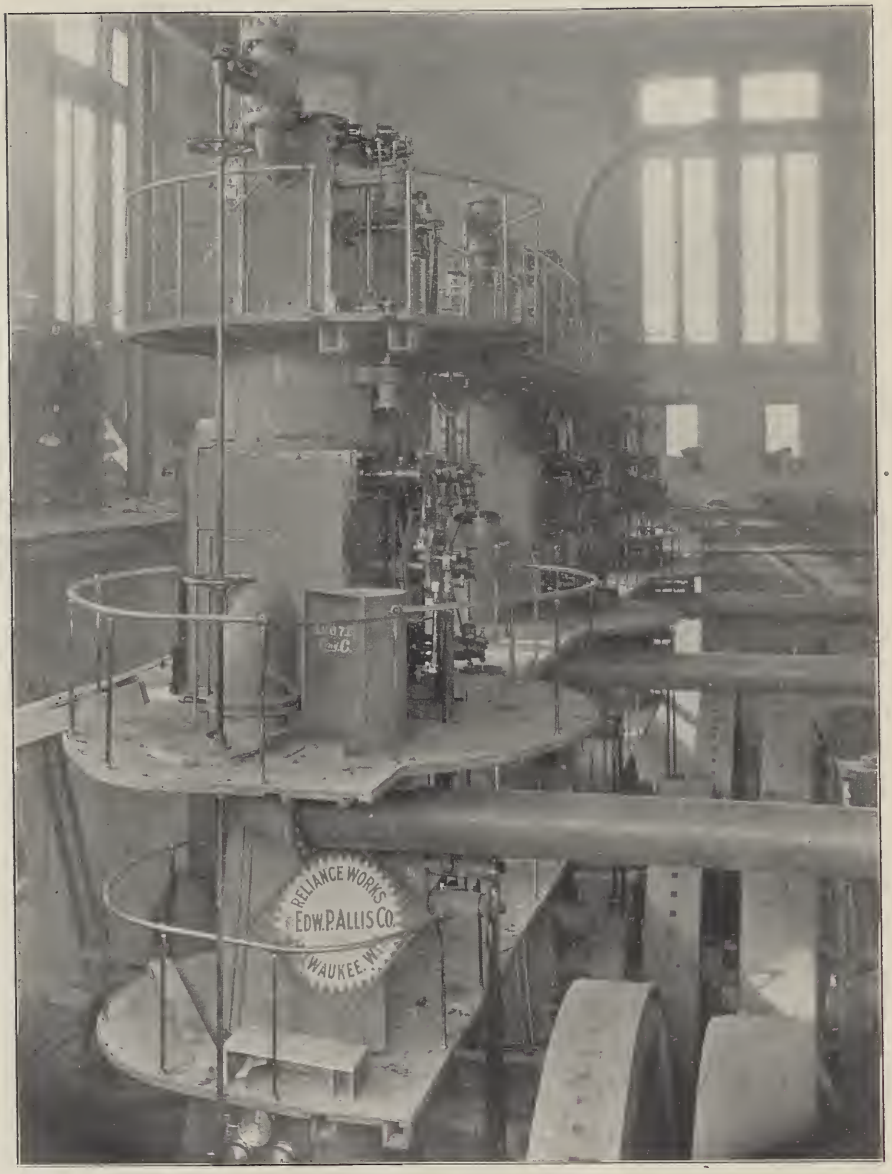
The present dimensions of the power-house are about 110 feet square. The height of the chimney is 175 feet above the boiler-grate surface, and the internal diameter of the chimney is 11 feet. The height from the floor of the machine-room to the roof is 64 feet. The length of the house, when completed, will be nearly 300 feet, and there will be a second chimney of the same size as the first. The rock excavation necessary for the extension of the house to this size has been done, and a portion of the river wall constructed for the entire length (see page 17), so that the extension may be made without interrupting the water-power operation of the portion of the plant now installed.

In constructing this plant there will have been done 36,000 cubic yards of earth excavation, 43,000 cubic yards of rock excavation, and 22,800 cubic yards of concrete masonry.

Machinery.—The present installation of machinery comprises four units, each unit consisting of a pair of 51-inch turbine wheels on the same shaft, a 750-kilowatt continuous current generator direct connected therewith, and a "steeple" tandem compound engine also direct connected to the generator. Only three engines are at present installed, but provision has been made for the fourth. The engines will run condensing, and are rated at 750 horse power at best economy, but are capable of being pushed to 1500 horse power. The pair of wheels will develop about 1400 horse power under the maximum head of twenty-seven feet. The generators are rated at 550 volts at no load, and 580 at full load. The condensing plant is of the siphon jet type, operating normally under the head from the canal to the river. A second condensing head at a higher level has also been provided, and a centrifugal pump, with a capacity of 1,600 gallons per minute, installed to meet the conditions of high water, when the natural head alone might be insufficient. The condensing plant has a capacity to take care of one-half of the ultimate installation, which will consist of eleven units like those above described, or an aggregate of 1,5000 horse power. The present boiler installation consists of two double batteries of Babcock & Wilcox water tube boilers, each single battery having three steam drums three and one-half feet in diameter and 20 feet 4 inches long, and 252 tubes 4 inches in diameter and 18 feet long, and being rated at 500 horse power. The boiler plant is provided with Knowles' feed pumps and Berryman heaters.

In addition to the above machinery, there will be on the machine room floor two drainage pumps with a combined capacity of 600 gallons per minute to handle any seepage which may percolate through the masonry during freshets; a gravity oiling system with tanks, pumps and filters; Lombard governors for controlling the speed of the water wheels; two balancing sets to control the three-wire distribution of the incandescent circuits; a booster set to equalize the voltage of the different feeders at times of maximum load, and two motor-driven alternating sets to handle the alternating current output. Overhead is a twenty-five ton electrically operated travelling crane to facilitate repairs and renewals.

Switchboard.—On account of the variety of the service from the station, the switchboard is rather more extended



View in Machine Room.

than usual. For the continuous current service there are at present ten generator, nine railway feeder, two balancer, one booster, nine light and power and two Watt meter panels—the latter for the railway feeders and for the balancer panels respectively. The switchboard was built for three voltages, the company having adopted the 235–470 volt 3-wire system for the distribution of light and power. There are two high and two low bus bars and one common neutral bus. The alternating current switchboard is not yet installed.

Distributing System.—There have been laid in the principal streets 41 duct miles of underground conduits, starting from the power house with sixty-four ducts. These ducts will carry at present about 25,000 feet of rubber covered, lead encased feeders, ranging in size from 250,000 to 600,000 circular mils, although their ultimate capacity is far greater than this. The underground mains are Edison tubes, of which about thirteen miles have been laid. The overhead feeders, ranging from 250,000 to 500,000 circular mils, aggregate at present 50,000 feet, and there are also about 30,000 feet of overhead mains. The total weight of copper thus far used for the distribution of the current amounts to 355,000 pounds.

It will be seen by reference to the accompanying map of the city that the station is situated almost at the centre of its load, a feature unusual with water-power installations. Within a radius of $1\frac{1}{2}$ miles two-thirds of its load is situated.

Steam Operation.—Owing to the situation of this plant, at the head of tidewater and at the very foot of the great falls, the backwater occasioned by extreme freshets is very great, and virtually destroys all the water power. Such conditions are of very rare occurrence and last but a few days at a time. They have obtained only four times in the past 40 years—viz.: in 1870, 1877, 1885, and 1899.

As a plant of this character can never stop, it was necessary to provide a steam plant sufficient to carry the full load during such times. With such an equipment the station is prepared not only for all ordinary backwater interference, but also for extreme low water conditions. It is not expected that the amount of steam-running required on both accounts will exceed, with the present installation, ten or twelve per cent. of the total output. For this reason it was not thought advisable to use mechanical stoking nor to put in economizers.

Personnel of the Work.—The contract for constructing the entire work was entrusted to the James River Construction Company, Mr. R. Lancaster Williams, President. The principal sub-contractors were as follows:

Dam, Canal and Power House Foundations—Winston & Company, Chicago.

Structural Iron of Roof, &c.—The Riter-Conly Manufacturing Company, Pittsburg.

Roof Covering—Southern Expanded Metal Company, Washington ; Warren Ehret Company, Philadelphia.

Turbine Wheels—Stilwell-Bierce & Smith-Vaile Company, Dayton.

Governors—Lombard Water Wheel Governor Company, Boston.

Engines—The Edward P. Allis Company, Milwaukee.

Boilers—The Babcock-Wilcox Company, New York.

Piping—Thos. C. Basshor & Son, Baltimore.

Condensing Apparatus—Henry R. Worthington, Brooklyn.

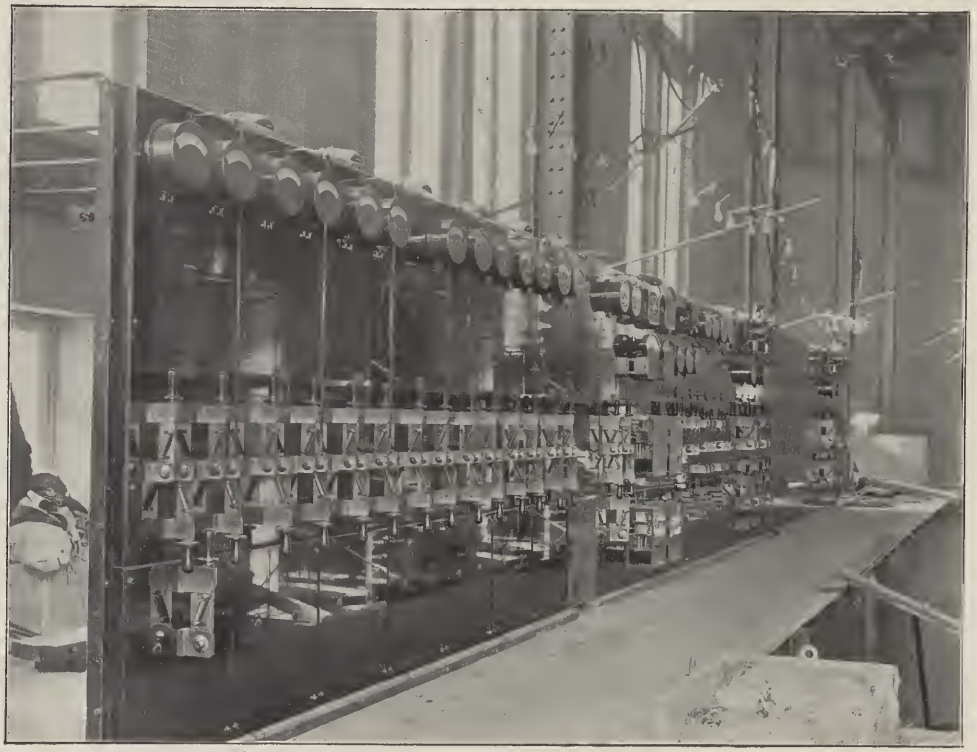
Generators, Switchboard, &c.—The General Electric Company, Schenectady.

Travelling Crane—The Whiting Foundry Equipment Company, Chicago.

Underground Conduits—Myers & Gasser, Richmond.

Cables and Wires—The John A. Roebling Sons Company, Trenton.

The design and construction of the hydraulic portion of the work, construction of power house, &c., has been in charge of Mr. Reuben Shirreffs, M. Am. Soc. C. E., Chief Engineer of the Development Company, while Mr. J. F. Apsey has superintended the work on the part of the Construction Company. The steam and electrical features have been largely designed by Mr. Edward J. Willis, A. S. M. E., but since his resignation in the spring of 1900, Mr. J. P. Pope, Superintendent of the Company, has been in charge of these matters. Sargent & Lundy, of Chicago, have been consulting engineers in this department.



SWITCHBOARD.

Manchester Canal.

This property, consisting of about thirty acres of land, with a water power canal and dam appurtenant, is situated on the south bank of the river immediately opposite the new plant above described. It was bought by the Development Company in 1899. There are now on this property several large mills and factories using in all some 800 horse power of water. It will not be the policy of the Development Company to add to the use of water

power on this level, since the head and fall on the north side of the river is considerably greater. There is, however, room on the property for a very considerable use of electrical power and a strong inducement to locate there exists in the exemption from municipal taxes enjoyed by the land and all improvements put thereon.

PROSPECTIVE BUSINESS.

The Development Company has already contracted with the Richmond Locomotive Works, The W. R. Trigg Company, The Richmond Traction Company, and The Richmond Electrical Company to supply them with power. In addition to these large customers, many smaller contracts have also been made, for both lights and power, although no active canvassing has been done of late. The total load already contracted for will amount to over 4,000 horse power.

A careful enumeration of the power users of Richmond, made in 1897, showed that the total requirements of the manufactures and trade of the city exceeded the sum of 12,000 horse power. Of this amount some 3,500 horse power was derived from water power; of the remainder 5,500 horse power was either derived from electricity or well adapted therefor, while the remaining 3,000 was put down as "not adapted" to the use of electrical power. The latter list included all of the tobacco manufactories, and it is not by any means positive that they can not advantageously use electrical power. Since this list was made, however, there has been a very considerable increase in the demand for power, notably by the establishment of the W. R. Trigg Company, which was not in existence in 1897, by the very large additions to the plant of the Richmond Locomotive Works in the past two years, and by the additions to the mileage of the street railway systems and the large increase of their traffic.

It is fair to assume that the low rates for power which the Development Company is offering, and the reliable service which they have prepared themselves to furnish, will very quickly add to their list of customers all existing power users adapted to be operated by electricity. Furthermore, electric lighting in the city has been very poorly developed and a large increase in this department may be confidently expected. These low rates, together with the other advantages possessed by Richmond as a manufacturing center, will attract such enterprises from abroad and stimulate their establishment by home enterprise.

It is not at all beyond the bounds of reasonable expectation that within a year from the starting of the new plant its capacity will be fully taxed to meet the demands upon it, and that the extensions prepared for will require to be begun.

Portland Cement Ashlar for Superstructure.

PRESSES OF EVERETT WADDEY CO.,
RICHMOND, VA.
1901.